

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent Application

Applicant(s): Y. Diao et al.
Docket No.: YOR920030088US1
Serial No.: 110/648,179
Filing Date: August 26, 2003
Group: 2123
Examiner: Juan Carlos Ochoa

Title: Methods and Systems for Model-Based
Management Using Abstract Models

DECLARATION OF PRIOR INVENTION UNDER 37 C.F.R. §1.131

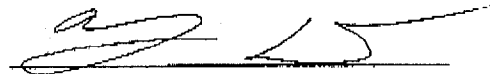
We, the undersigned, hereby declare and state as follows:

1. We are named joint inventors of the invention that is the subject of the above-referenced U.S. patent application. We have assigned our respective interests in the patent application to International Business Machines Corporation ("IBM").
2. The invention falling within the scope of the claims in the present application was conceived and reduced to practice at some time prior to July 3, 2002.
3. On or about July 3, 2002, an IBM proprietary presentation named "YixinDemoShots070302.PRZ" describing the invention was prepared. A copy of the relevant portion of this presentation, consisting of slides 6-16 thereof, is attached hereto as Exhibit 1.
4. The slides attached hereto as Exhibit 1 demonstrate an actual reduction to practice of the invention in the form of experimental results generated using an exemplary embodiment according to the inventive principles.

5. All statements made herein of our own knowledge are true, and all statements made on information and belief are believed to be true.

6. We understand that willful false statements and the like are punishable by fine or imprisonment, or both, under 18 U.S.C. §1001, and may jeopardize the validity of the application or any patent issuing thereon.

Date: Oct. 12, 2007


Yixin Diao

Date: _____

Denise Y. Dyko

Date: _____

Frank N. Eskensen

Date: _____

Joseph L. Hellerstein

Date: _____

Alexander Keller

Date: _____

Lisa F. Spainhower

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Date: _____

Yixin Diao

Date: 10/11/2007

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Date: _____

Frank N. Eskensen

Date: _____

Joseph L. Hellerstein

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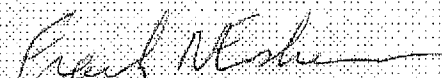
Date: _____

Yixin Diao

Date: _____

Denise Y. Dyko

Date: 10/12/02



Frank N. Eskesen

Date: _____

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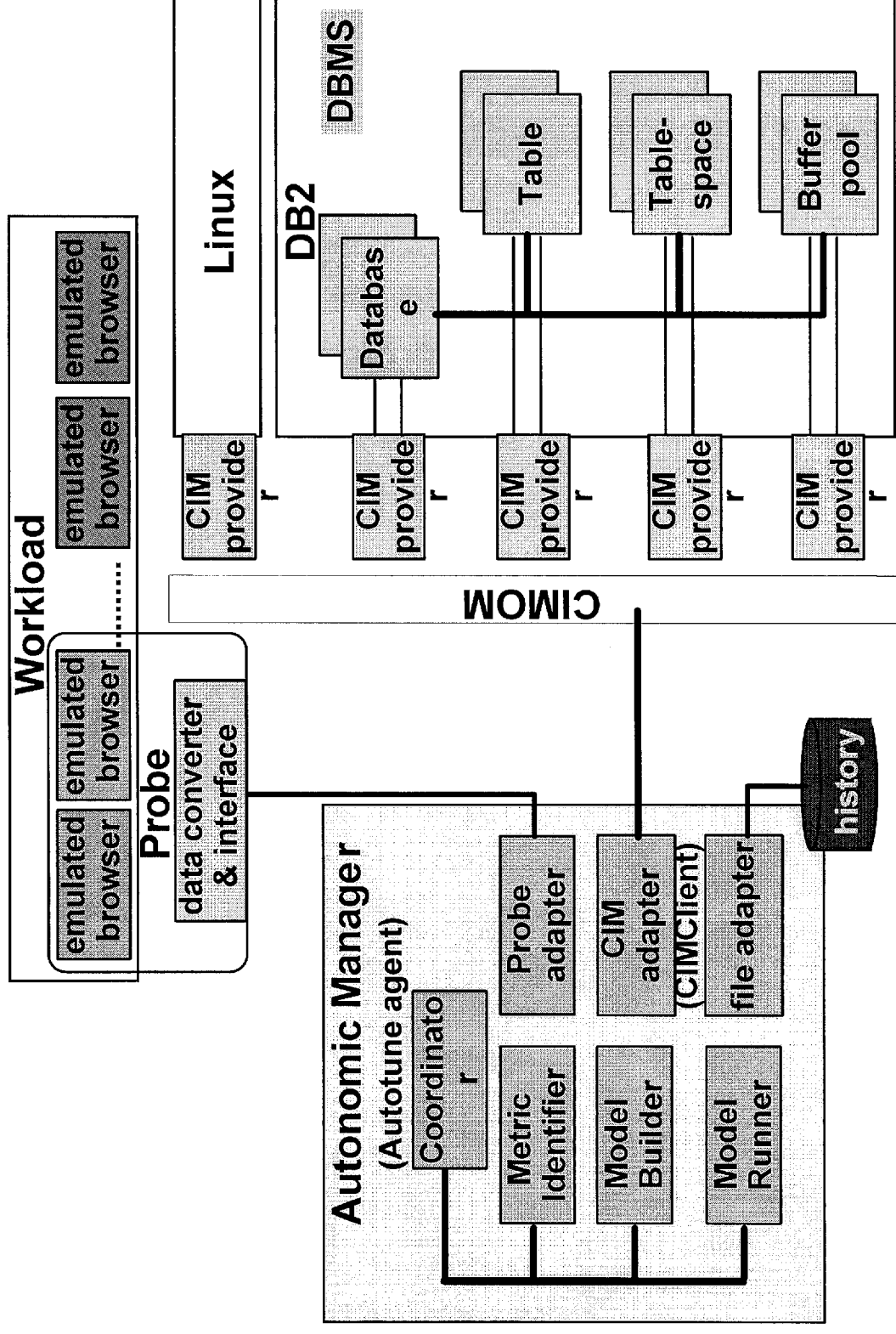
Alexander Keller

Date: 10-11-07

Lisa F. Spainhower
Lisa F. Spainhower

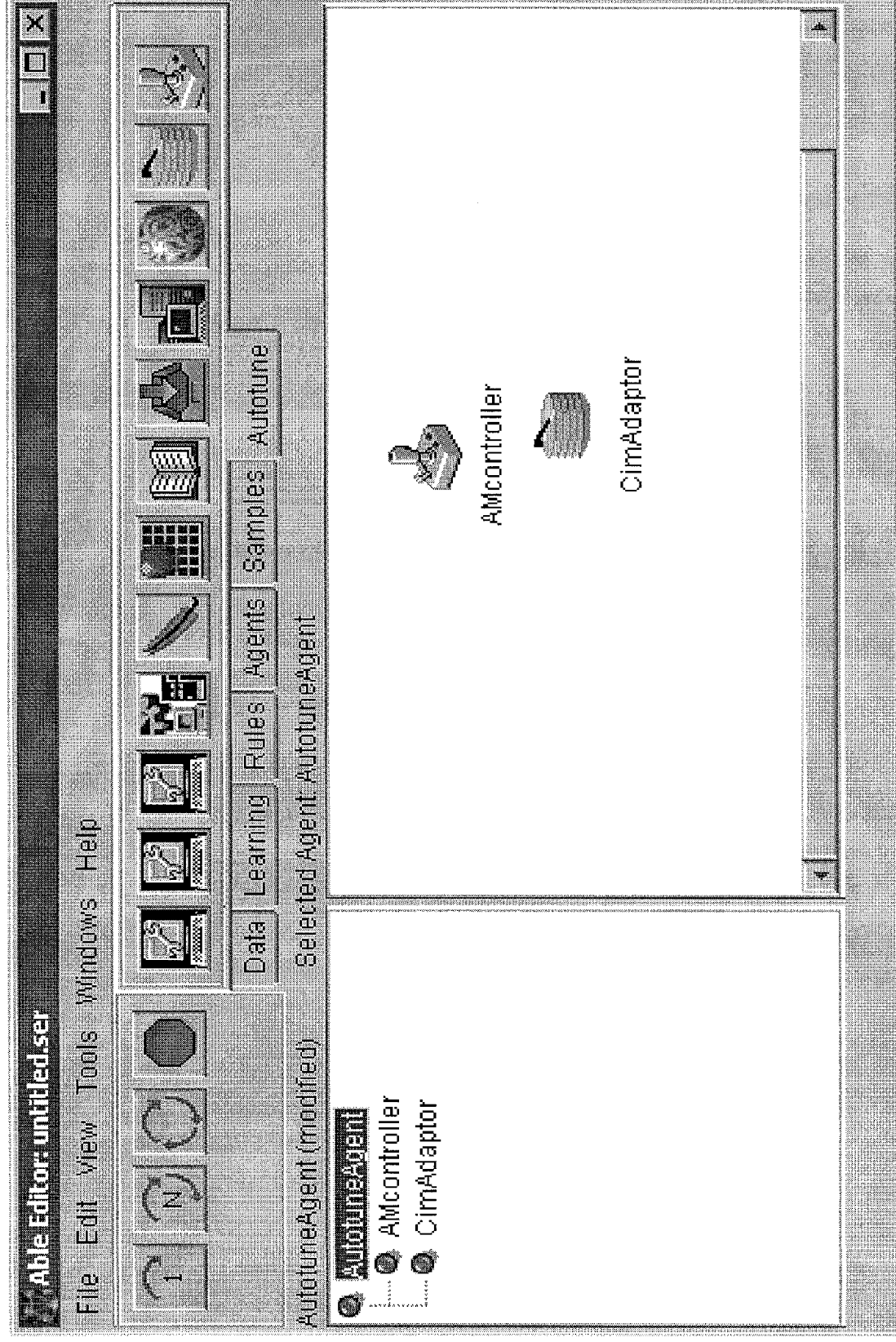
EXHIBIT 1

Architecture for demo: DB2 on Linux platform with TPC-W workload

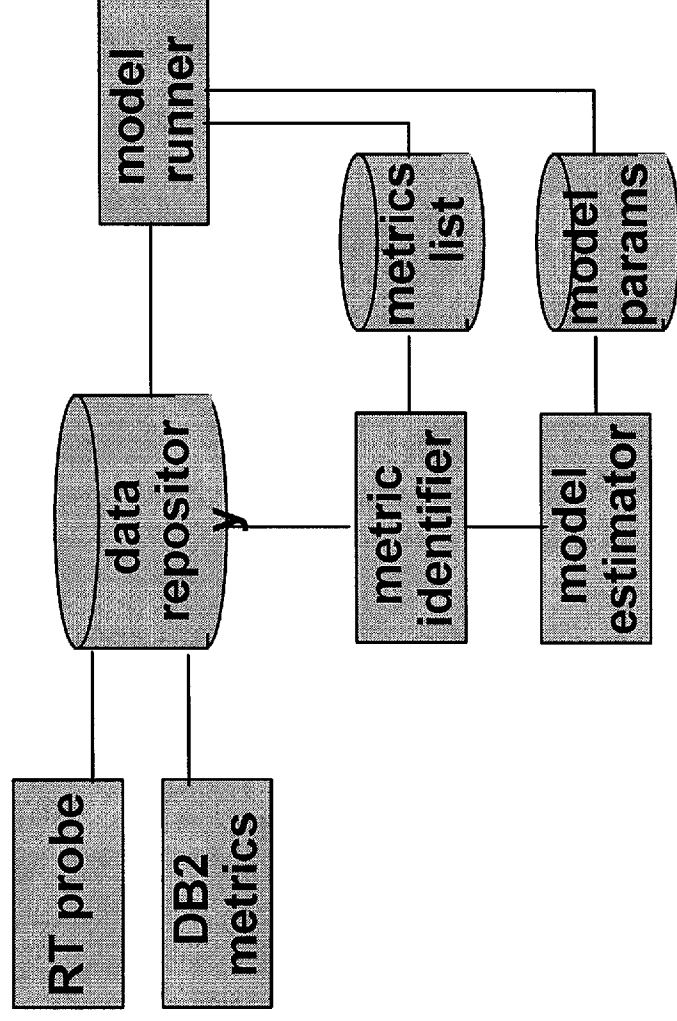


show what we build in one colour -e.g. CIM provider, all stuff in AM, and probe in

Building AM with AutoTune

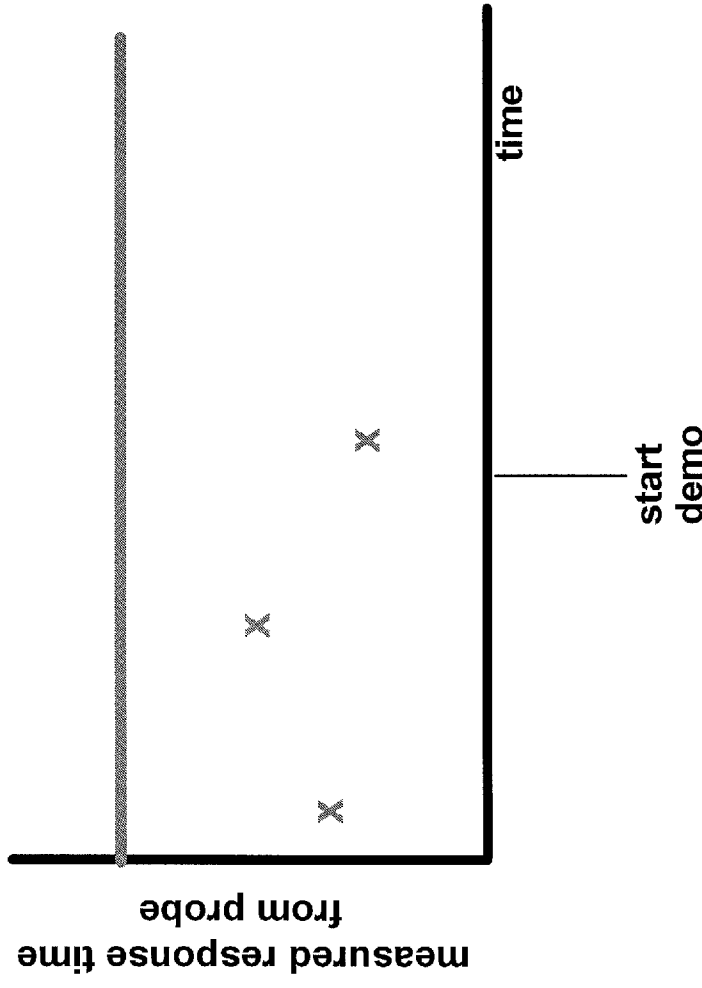
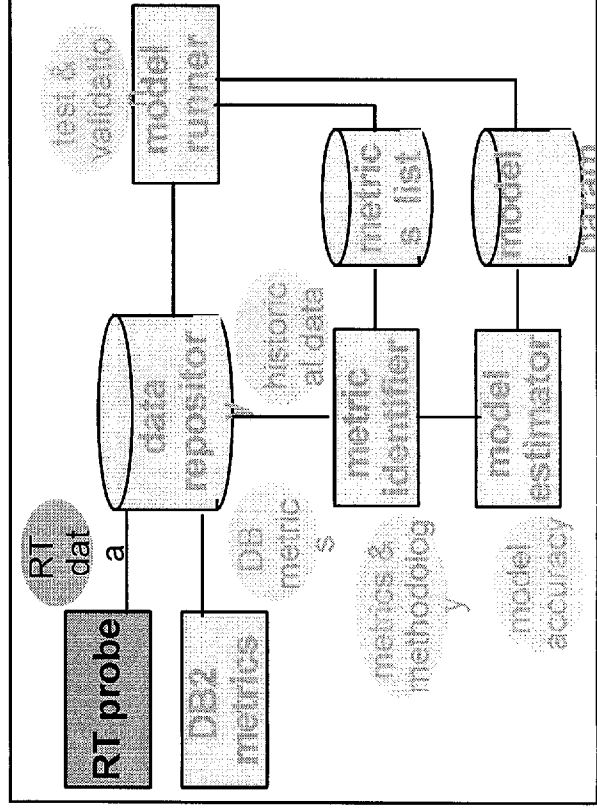


Demo Flow



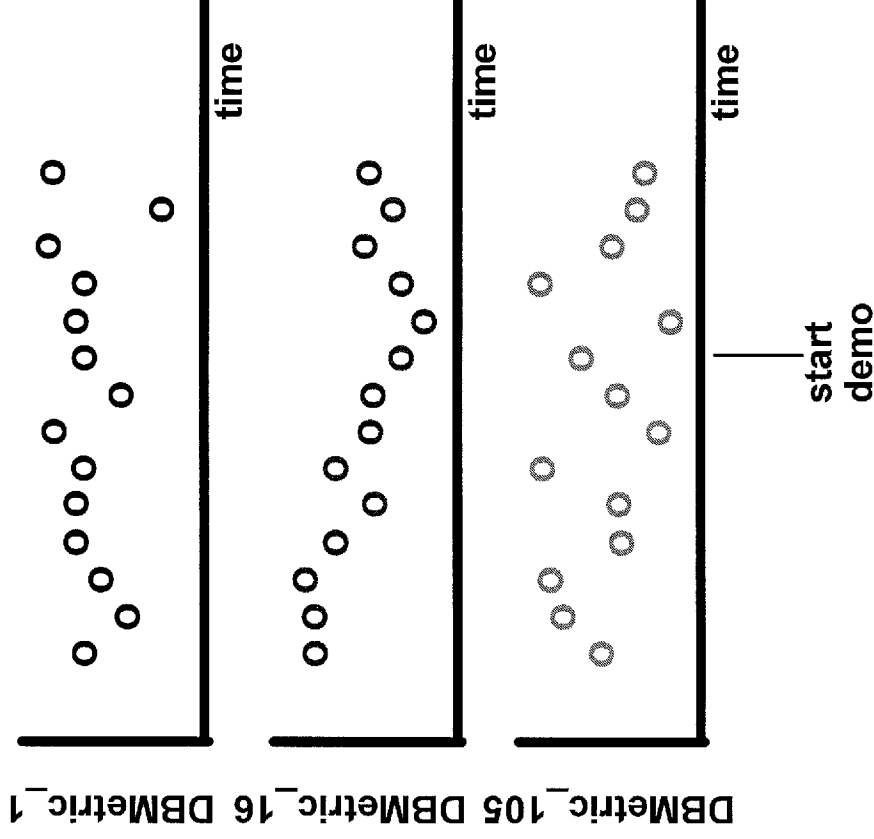
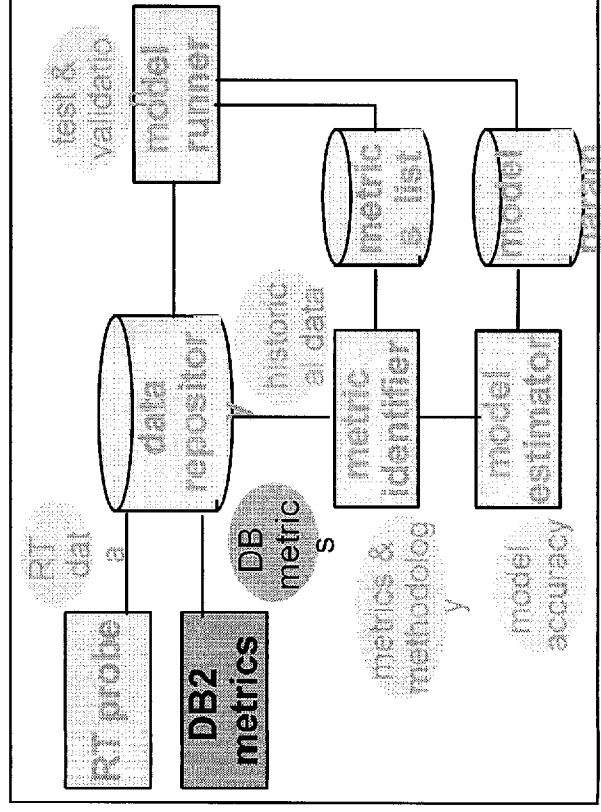
Metric Discovery - demo flow 1

- Show response time as is being collected from probe
 - e.g. one point every 20 sec (20 min for model build) from RT probes
 - (avg over several TPC-W emulated browsers)
 - need to be running/collecting data before demo starts or read in from file
 - require connection to machine w DB server and EBs?



Internal metrics from DB2 from CIM providers - demo flow 2

- Show internal DB2 metrics being collected by Autonomic Manager at rapid intervals
 - Demonstrates the operational capability of the abstract model
 - interface between AM Autotune agent and DB2 CIM provider
 - Show time series of several (2-4) metrics
 - every 2 sec (2 min for model build)



Getting Properties from CIMOM

C:\WINNT\System32\cmd.exe

Value: IBM_DB2 Data Base Management System Tablespace Statistical Data. IBM and DB2 are registered trademarks of the International Business Machines Corporation

Name: IBM_DB2TableSD.InstanceID=IBMDE2="tpecw", DENAME="TPCW", TABLE="TEMP <000001, 000002>"=RowsRead

Value: 3355

Name: IBM_DB2BufferpoolSD.InstanceID=IBMDE2="tpecw", DENAME="TPCW", BPOOL="IBMDEFA

ULIBP":DirectReadReqs

Value: 0

Name: IBM_DB2TablespaceSD.InstanceID=IBMDE2="tpecw", DENAME="TPCW", SPACE="USERSPA

CE1":PoolIndexPReads

Value: 0

Name: IBM_DB2TablespaceSD.InstanceID=IBMDE2="tpecw", DENAME="TPCW", SPACE="IS_CUST

OMER":PoolDataWrites

Value: 0

Name: IBM_DB2TablespaceSD.InstanceID=IBMDE2="tpecw", DENAME="TPCW", SPACE="SYSYGATS

PAGE":InstanceID

Value: IBMDE2="tpecw", DENAME="TPCW", SPACE="SYSYGATSPACE"

Name: IBM_DB2TablespaceSD.InstanceID=IBMDE2="tpecw", DENAME="TPCW", SPACE="SYSYGATS

PAGE":PoolIndexLReads

Value: 0

Total properties: 453

Numeric metrics: 353

Actions | Functions

Use Server

Browse...

Get

Data Repository: C:\Diao\GAC\AutoTune\SSIdemo

Cim Parameters: Cim_StatisticalData

OK Cancel Help

CimAdaptor Inspector

Bean Edit Data View Options Help

CimAdaptor

Y axis

500
300
100
0

X axis

10

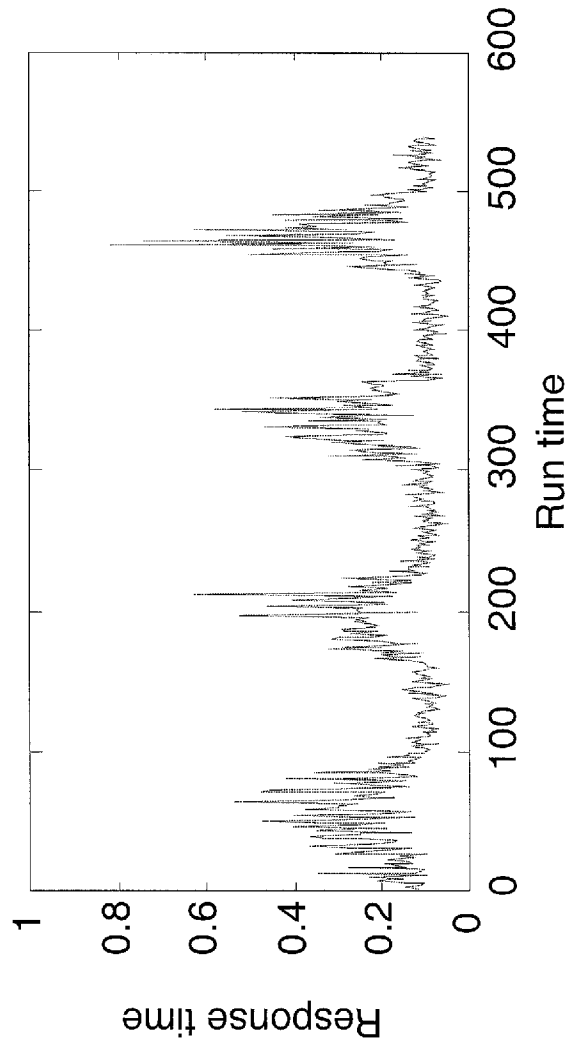
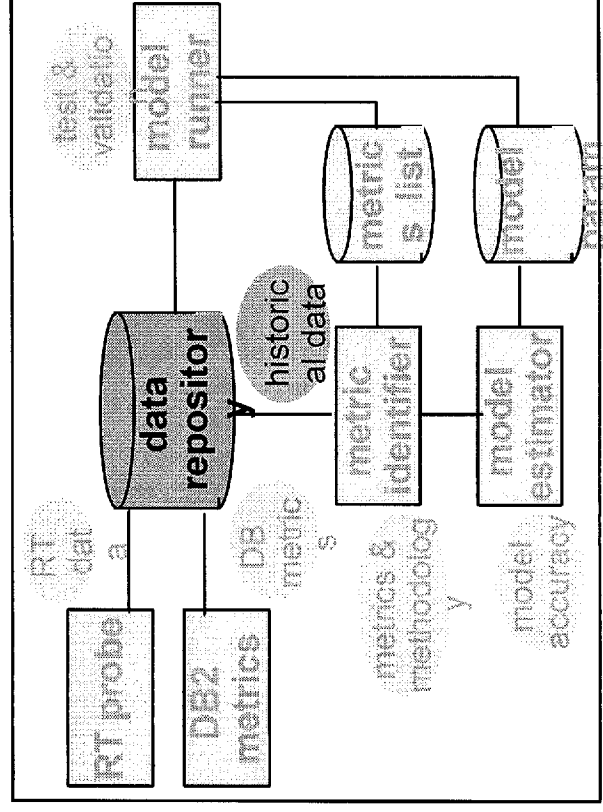
Footer

Metric discovery: done with historical data

- demo flow 3

- Model build using historical data

- Data collected over 10-20 hours from response time probes and DB
 - mixed workload (vary buy/browse) and varied (# emulated browsers)
 - training time length a concern?
- RT every 20 min (RT averaged over k min, $k \sim 2-5$ min) and DB metrics every k min
 - cannot use the shorter intervals in real time part of demo as averages over 2 sec will have a lot of noise and RT probe sampling every 20 sec is unrealistic

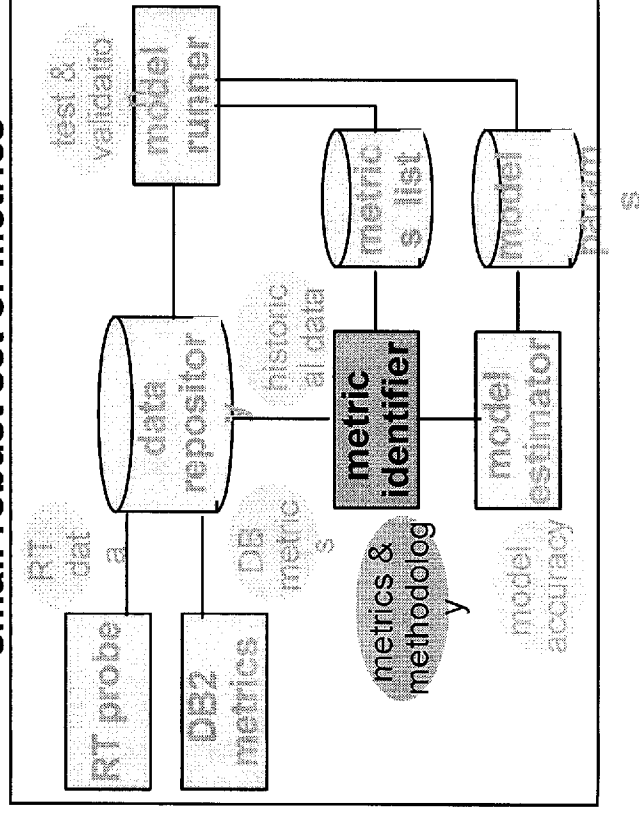


Metric discovery: identify relevant DB metrics- demo flow 4

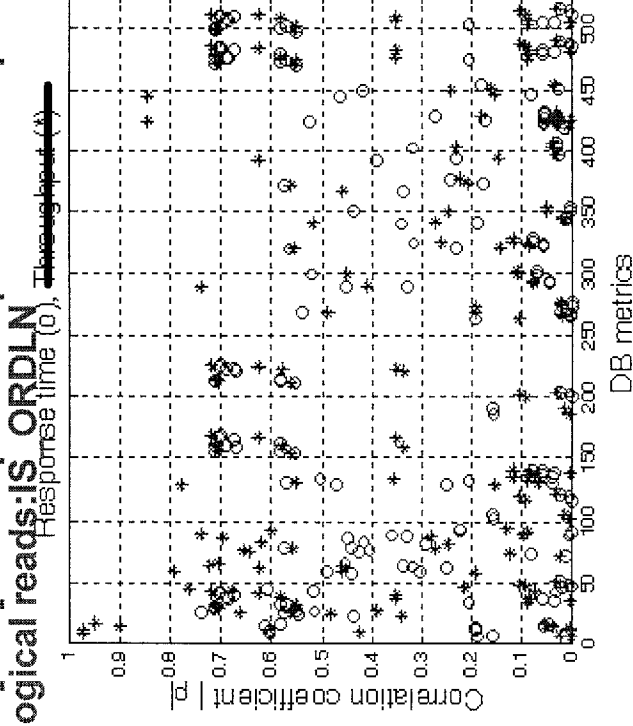
■ Metric identification

- DB metrics are a mix of cumulative stats and actual snapshots
 - use metrics as is and 1st order differences in search for correlations to response time
- Report relevant metrics: high (and ~ independent) correlations to RT

—small robust set of metrics



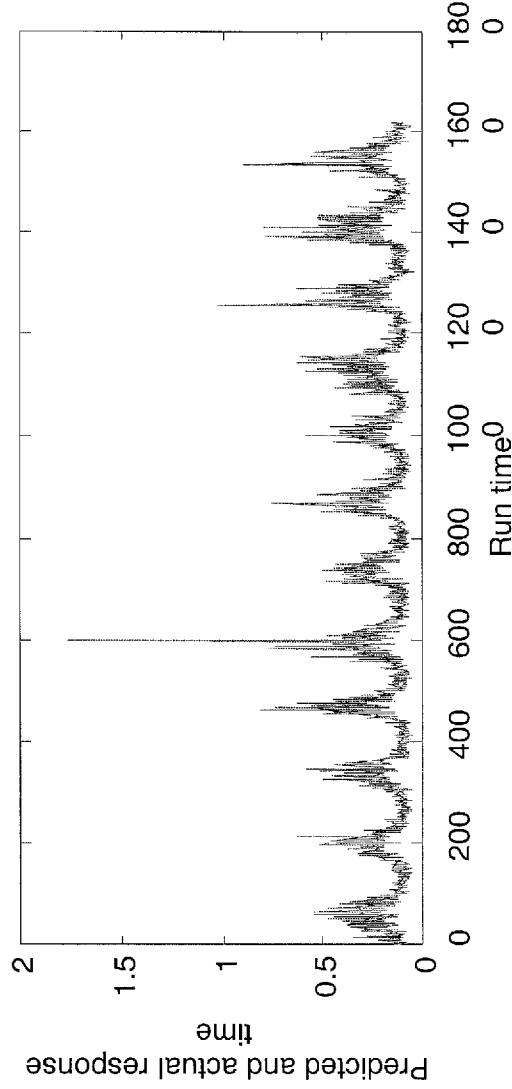
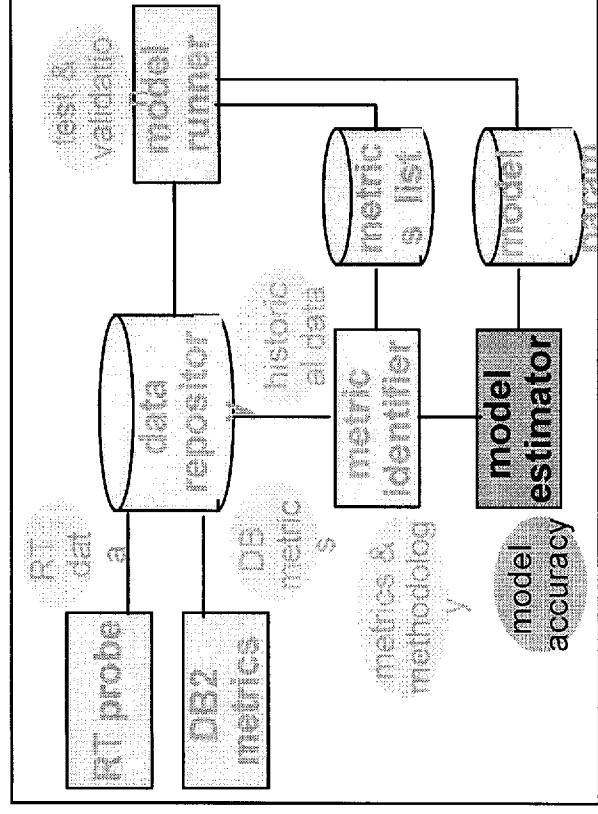
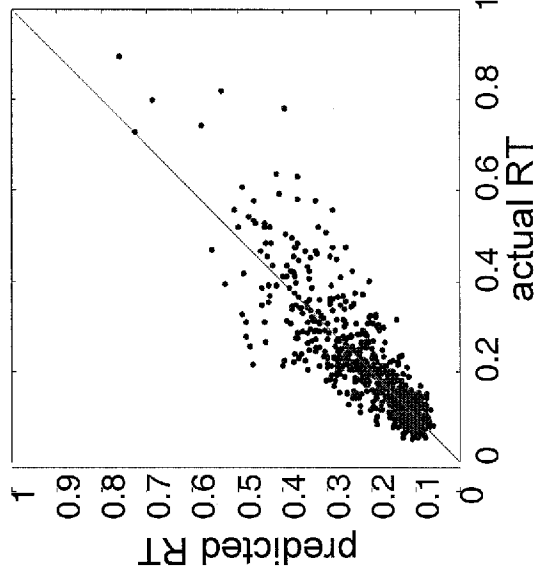
1. [25] Database Snapshot:Total sort time (ms)
2. [24] Database Snapshot:Total sorts
3. [10] Database Snapshot:Appls. executing in db manager currently
4. [58] Database Snapshot:Host execution elapsed time
5. [351] Tablespace Snapshot:Total buffer pool read time (ms):TS_ORDLN
6. [159] Bufferpool Snapshot:Total buffer pool read time (ms):BP_TEMP4K
7. [367] Tablespace Snapshot:Buffer pool data logical reads:IS_ORDLN



Metric discovery: build inference model for predicted response time- demo flow 5

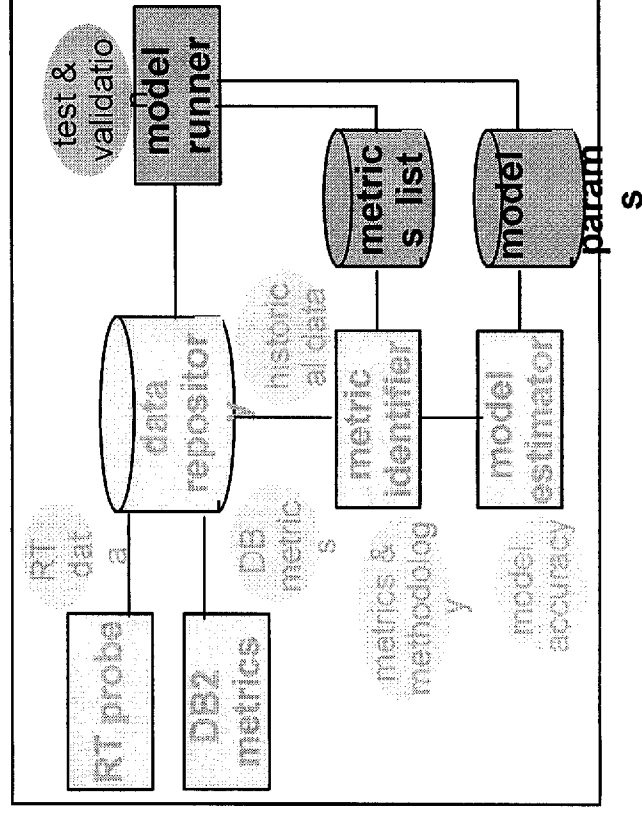
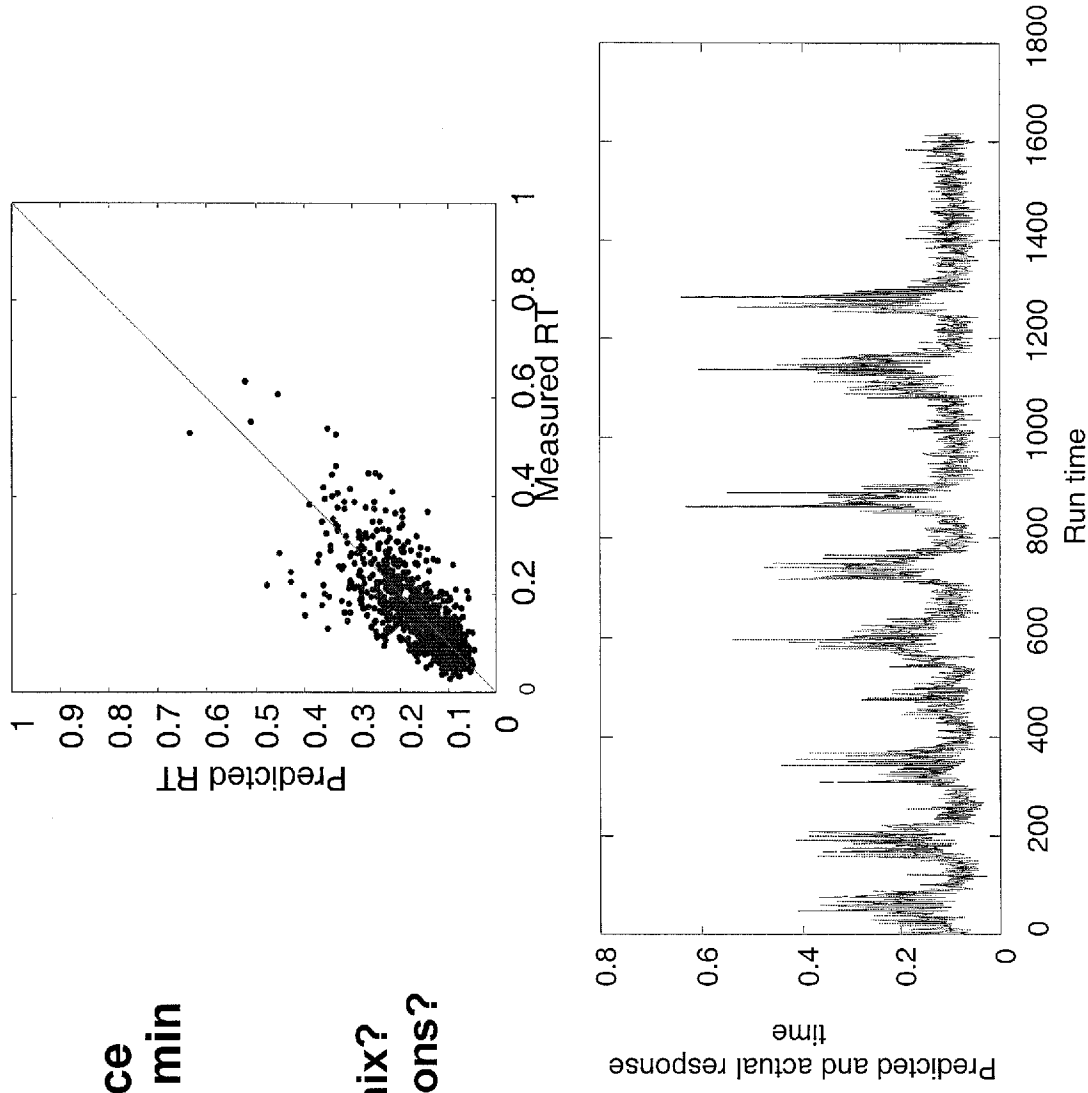
- Build estimation model for response time with historical data

- Use linear regression model
 - dependency of model parameters on system and workload state not well characterized at this point
- Other models possible - e.g. neural net



Metric discovery - demonstrate inference model time- demo flow 6

- Test inference model with saved test data
 - Not feasible to do in real time since RT probe data collected every 20 min only, and predicted RT reported every 2 min
 - robustness...
 - across wider range of workload mix?
 - system loads from other applications?



AM Operation

